

French Patent No. 2,696,404

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P.O. Box 4828, Austin, TX 78765 USA

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DEVICE FOR LOCKING THE POSITION OF AN ADJUSTABLE STEERING  
COLUMN, PARTICULARLY OF AN AUTOMOBILE AND THE COLUMN  
ASSEMBLY WHICH CONTAINS SUCH A DEVICE

Inventors:

André Hoblingre and  
Patrick Courvoisier

Applicant:

Company known as:  
ECIA--Equipment and  
Components for the  
Automobile Industry,  
France

Representative:

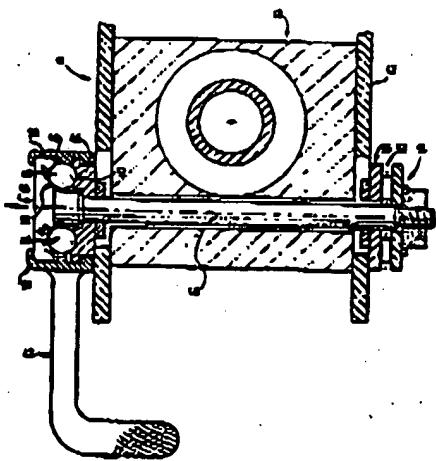
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List of the Documents Cited in  
the Preliminary Search Report:

See end of the present  
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## [Abstract]

This device, which contains a support structure equipped with two plates (41,42) between which is placed the column (43) and means for locking the column by moving the plates toward each other, consisting of a rod (40) which extends between the plates, one end of which is connected to locking elements which contain a rod stopping device (44), an intermediate bearing device (45) in contact with one plate, and the means for spacing (46) placed between the two devices, is characterized by the fact that these means for spacing include at least one rolling device (48,49) between the facing surfaces of the devices, and the means of displacement (50) of this rolling device along a ramp (52) provided on the corresponding surface of the intermediate bearing device (45) and by the fact that at least one part of the rod connected to the stopping device can be displaced by rotation to follow the displacements of the rolling device.



The present invention relates to a device for locking the position of an adjustable steering column, particularly that of an automobile, and column unit which contains such a device.

Some automobiles have already been equipped for several years now with devices for adjustment of the position of the steering wheel, intended to adapt the position of the latter to the morphology of the driver of the vehicle.

Thus, the position of the column and therefore, of the steering wheel can be adjusted axially or by pivoting.

In the state of the art, these adjustment devices include a column support structure connected to the rest of the structure of the vehicle and containing two plates between which the steering column is placed and the means for locking the steering column in position by moving the plates toward each other.

These locking means include, for example, a rod which extends between the plates, the first end of which presses on one of the plates and the second of which is connected to the locking elements.

Different modes of realization of these locking elements have been proposed.

Thus for example, these locking elements may be composed of a screw-nut system, a toggle lever system, or even an eccentric system connected to a maneuvering lever.

Another mode of realization of this locking means is described in the British Patent No. A-2,113,164 in the name of Ford Motor Company Limited.

This document describes a device whose general structure is of the form described above and in which the locking elements include a stopping device at the second end of the rod, an

intermediate bearing device in contact with the other plate of the support structure, and which can be displaced axially on the rod, and a control device placed between the stopping device and the intermediate bearing device, connected to a control lever, and which can be displaced by rotation in a plane perpendicular to the rod, between an active locking position of the column and a retracted locking position of the latter.

The opposing surfaces of the control device and the intermediate bearing device or the stopping device, include the one, at least one projecting part adapted to work with the ramp of the other, to spread these two surfaces apart from each other and thus the corresponding locking elements in order to bring the plates closer together to lock the column, when the control lever is moved.

In the embodiment mode described in this document, the projecting parts consist of bosses made of one piece with the control device, and the ramps are arranged on the intermediate bearing device.

Nevertheless, this device presents a certain number of disadvantages in the control lever.

Indeed, it is clear that the greater the tightening of the column to be obtained, the greater the friction between these different locking elements and thus, the more difficult the manipulation of the lever.

French Patent No. A-2,671,040 in the name of the applicant, proposes different solutions to resolve these problems.

To this end, this document relates to a locking device such as described above in which said projecting part includes a rolling device connected to the corresponding locking device.

Two rolling devices may be placed on the corresponding locking element, on both ends of the rod, and may be adapted so that each works together with a facing ramp of the surface which corresponds to the other element.

Advantageously, these rolling devices are placed between the control device and the intermediate bearing device, and the rolling elements are placed between the stopping device and the control device.

According to a particularly advantageous mode of embodiment described in this document, the rolling device or each rolling device placed between the control device and the intermediate bearing device and the rolling device or each rolling device placed between the control device and the stopping device of the second end of the rod, are placed two by two in a same recess crossing the control device, by pressing one against the other, causing one to project between the control device and the intermediate bearing device, and the other between the control device and the stopping device.

It is mentioned in this document that these devices and rolling elements may consist of balls.

However, the different modes of embodiment described in this document, although representing a certain number of advantages with respect to the prior art devices, remain subject to friction and wear of parts, and particularly, of the rolling devices and elements, which eventually causes functional problems of the device.

Naturally, these problems may be resolved by using parts which present adapted properties of mechanical resistance, but this then causes an increase in the production cost of the device.

The goal of the present invention is to resolve these problems of wear by proposing a device which is simple, reliable, and whose cost is as low as possible.

To this end, the object of the invention is a device for locking the position of an adjustable steering column, particularly, of an automobile of the type which contains a support structure of the column connected to the rest of the structure of the vehicle and which contains two plates between which the steering column is placed, and the means for locking the column in position by bringing the plates together, including a rod which extends between the plates, the first end of which has a means of bearing on one of the plates and the second end of which is connected to the locking elements which contain a stopping device at the second end of the rod, a first intermediate bearing device in contact with the other plate of the support structure and which can be moved axially on the rod and the means for spacing placed between the stopping device and the intermediate bearing device, connected to the means of control and which can be displaced by rotation in a plane which is perpendicular to the rod, between an active locking position of the column and a retracted locking position of the latter, characterized by the fact that the means for spacing include at least one rolling device placed between the facing surfaces of these intermediate bearing devices and stopping devices, and the means for displacement of this rolling device along a ramp

provided on the corresponding surface of the intermediate bearing device, where these means for displacement are connected to means for control which can be displaced by rotation around the rod to bring the rolling device to separate these surfaces facing the intermediate bearing device and the stopping device, in order to bring the plates towards each other and to lock the column in position, and in that at least one part of the rod connected to the stopping device can be moved by rotation to follow the movements of same at least one rolling device.

According to another aspect, the invention also has as its object a steering column unit for automobiles whose position can be adjusted, characterized by the fact that it contains a locking device according to any one of the preceding claims [sic].

The invention will be better understood using the description which follows given only as an example and making reference to the appended drawings in which:

- Figure 1 represents an exploded view of a device for locking the position of an adjustable steering column for a vehicle, described in British Patent No. A-2,113,164;
- Figure 2 represents an oblique view of an embodiment mode of the locking means which enters into the structure of a locking device described in French Patent No. A-2,671,040; and
- Figure 3 represents a cross section of an embodiment mode of the locking means which enters into the structure of a locking device according to the invention.

Thus it can be seen in Figure 1, which represents a device for locking the position of an adjustable steering column 1 of a vehicle, described in British Patent No. A-2,113,164, that this column 1 is placed in connection device 2 which is placed between

plates 3 and 4 of column support structure 5 which is connected to the rest of the structure of the vehicle by any appropriate means.

This device also includes means 6 for locking the column in position by bringing plates 3 and 4 of the support structure close together. These locking means include for example rod 7 which extends between the two plates 3 and 4 of the support structure, and the first end of which 7a presses upon one of the plates, for example 3, and the other end of which 7b is connected to locking elements 8.

These locking elements include stopping device 9 which consists for example, of screw 10 connected to pin 11 and which is placed on the second end 7b of rod 7, intermediate bearing device 12 which is in contact with the other plate 4 of the support structure and which can be moved axially on rod 7, and, finally, control device 13 placed between stopping device 9 and intermediate bearing device 12, connected to control lever 14, and which can be moved by rotation in a plane perpendicular to rod 7, between an active locking position of the column and a retracted locking position of the latter.

In the embodiment mode represented in this figure, the opposing surfaces of control device 13 and intermediate bearing device 12 contain one of the projecting parts 15 which is adapted to work together with ramps 16 of the other, to spread these two surfaces apart from each other, and thus, the corresponding locking elements, in order to bring the plates close together to lock the column in position when the control lever is moved.

If one now refers to Figure 2, which represents an oblique view of the locking means which are included in the structure of

a locking device described in French Patent No. A-2,671,040, it can be seen that these means also include rod 20, one of whose ends 21 is threaded and adapted to work together with screw 22 and bearing washer 23 on one of the plates of the support structure.

It will be noted that the parts of the device which are not described in regard to this figure may be identical to those described with respect to Figure 1.

The other end of the rod has the locking elements which consist of stopping device 24 consisting for example, of a fixed stopping plate at the corresponding end of rod 20, and intermediate bearing device 25 adapted to press against the other plate of the support structure, and this intermediate bearing device is mounted such that it can be moved axially on the rod.

These locking elements also include a control device 26 which is placed between stopping device 24 and intermediate bearing device 25, connected to control lever 27, and which can be moved by rotation in a plane which is perpendicular to rod 20 between an active locking position of the column and a retracted locking position of the latter.

Thus it can also be observed that the surface of intermediate bearing device 25 which is facing the control device has ramps 28 and 29, for example, diametrically opposed, which are adapted to work with the projecting parts on the corresponding surface of control device 26.

More particularly, these projecting parts may consist of rolling devices connected to this control device, and these

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rolling devices consist, for example, of balls 30 and 31 placed in the respective recesses 32 and 33 which are arranged in the corresponding surface of control device 26.

It is indicated in this document that rolling elements consisting, for example, of balls 34 and 35, may also be placed between stopping device 24 and control device 26.

These balls are, for example, placed in recesses 36 and 37 arranged in the corresponding surface of control device 26 facing stopping device 24.

The displacement of control device 26 and thus of control lever 27 is facilitated in that these rolling elements and devices facilitate the displacement of the different locking elements with respect to each other.

Rolling elements 34 and 35 ensure the maintenance of correct position of control device 26 with respect to stopping device 24 while facilitating the displacement of the control device when rolling devices 30 and 31 move on ramps 28 and 29 of intermediate bearing device 25 to spread apart the facing surfaces of this intermediate bearing device and the control device, in order to spread these locking elements to make the plates come closer together and to lock the column in position when control device 26 is moved.

As indicated above, these devices of the state of the art present a certain number of disadvantages.

In Figure 3, a mode of embodiment of the locking means which are included in the structure of a locking device according to the invention is represented.

These locking means still include rod 40 which extends between plates 41 and 42 of a support structure of a steering column designated by the general reference number 43.

One of the ends of rod 40 is adapted to work with plate 41 and contains stopping device 44 and a first intermediate bearing device 45 which can be displaced axially on rod 40, in contact against plate 41 and locked by rotation with respect to the latter. Spacing means 46 are placed between these intermediate bearing and stopping devices and are connected to control lever 47 to lock the column into position.

These spacing means consist of at least one rolling device and, in the example illustrated, two rolling devices 48 and 49, each consisting, for example, of a ball placed on either side of the rod, between the facing surfaces of intermediate bearing device 45 and stopping device 44.

Means 50 are provided to move the rolling device or each rolling device 48,49 along a corresponding ramp provided in the corresponding surface of intermediate bearing device 45.

The ramp or each ramp may, for example, be composed of a ramp which is similar to ramp 28 or 29 of intermediate bearing device 25 described with respect to Figure 2.

These means of displacement 50, which advantageously include a displacement cage of the rolling device or of each rolling device, are connected to the control lever designated by the general reference number 47 on this figure, and are mounted so that they can be moved in rotation around rod 40 to bring the rolling device or each rolling device 48,49 to separate these

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surfaces with respect to intermediate bearing device 45 and stopping device 44, in order to bring the plates closer together and to lock the column into position.

In the realization example represented in this Figure 3, the means of displacement 50 consisting of the cage, are connected to a protection cap 51 which is placed around the locking means, and which is movable by rotation around the latter, and control lever 47 is of one piece with this cap.

It will be also be noted that the rolling device or each rolling device is mounted in movable fashion between the corresponding ramp of intermediate bearing device 45 and a corresponding throat 51 which is arranged in the surface of stopping device 44 facing the surface of the intermediate bearing device on which the ramp or each ramp is provided.

Naturally, this ramp may also be formed by the base of throat 52 which receives the ball or each ball, arranged in this device.

The use of these throats allows obtaining a better distribution of forces on the greatest contact surface between the corresponding parts.

At least one part of the rod connected to the stopping device, and, more particularly, in the realization example represented in this Figure 3, rod unit 40 is mounted to rotate in the plates of the support structure to follow the movements of the rolling device or of each rolling device, in order to reduce the various frictions which are caused by these movements.

These rolling means 53 consisting, for example, of a stop with pins may then be placed at the other end of rod 40 between bearing means 54, which include for example, a screw and a washer

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stopped in rotation on this rod 40, and a second intermediate bearing device 55 in contact with the other plate 42, and locked in rotation with respect to the latter.

Thus it is clear that the different forces which act on the various parts of this device are distributed on the greatest contact surfaces between first intermediate bearing device 45, the rolling device or each rolling device 48,49, stopping device 44, bearing means 54 of the rod, rolling means 53, and the second intermediate bearing device 55, which allows reduction of the wear of these parts, and using parts made of standard materials, that is, without having to undergo costly metallurgical processing intended to increase their properties of mechanical resistance.

Indeed, the movement of these locking means between their retracted position and their active position is realized by movement of the rolling device or each rolling device by means of the lever, and of the displacement cage connected to the latter, where the stopping device, the rod, the bearing means, and the rolling means follow the displacement to avoid any friction between these parts.

The only friction which remains in the device according to the invention is, then, the friction between the rolling device or each rolling device and the displacement cage of the latter, when the lever is operated.

Naturally, different placements of these parts may be envisioned and various means for limitation of the course of the displacement of the lever may also be provided, for example, by complementary projecting parts of the intermediate bearing device and of the displacement cage of the rolling device or by means of

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recesses of the ramp and/or of the throat to cause the user to feel a discontinuity of force, such as that mentioned in French Patent No. A-2,671,040. These recesses also allow, for example, maintaining the device in the locked position.

Finally, it goes without saying that a means of control other than a lever may also be used, such as, a means of assistance with displacement, controlled, for example, by a user, such as that described in French Patent Application No. 9,202,101, filed February 24, 1992, in the name of the applicant.

### Claims

1. Device for locking the position of an adjustable steering column, particularly that of an automobile, such as one which has a column support structure connected to the rest of the structure of the vehicle and which contains two plates (41,42) between which the column is placed (43), and means for locking the column in position by bringing the plates close together, containing a rod (40) which extends between the plates, the first end of which has means (54) of bearing on one of the plates (42) and whose second end is connected to locking elements which have a stopping device (44), at the second end of the rod, a first intermediate bearing device (45) in contact with the other plate (41) of the support structure, and which can be moved axially on the rod, and a spreading means (46) placed between the stopping organ and the intermediate bearing organ, connected to the control means (47) and which can be moved by rotation in a plane perpendicular to the rod, between an active locking position of the column and a retracted locking position of the latter,

characterized by the fact that the spreading means contain at least one rolling device (48,49) placed between the facing surfaces of the intermediate bearing device and stopping device, and means of displacement (50) of this rolling device along a ramp (52) provided on the corresponding surface of the intermediate bearing device, and these displacement means are connected to control means, and can be moved by rotation around the rod to bring the rolling device (48,49) to spread these surfaces apart with respect to the intermediate bearing device and the stopping device, in order to bring the plates closer together and to lock the column in position, and by the fact that at least one part of the rod connected to the stopping device (44) can be moved by rotation to follow the displacements of said rolling device(s).

2. Device according to Claim 1, characterized by the fact that the rod unit can be moved by rotation between the plates and by the fact that the means of rolling (53) are placed between the bearing means (54) of the first end of the latter and a second intermediate bearing device (55) in contact with the corresponding plate (42).

3. Device according to Claim 1 or 2, characterized by the fact that the rolling device or each rolling device (48,49) is constituted by a ball.

4. Device according to Claim 1, 2, or 3, characterized by the fact that the rolling device or each rolling device is mounted in movable fashion between the ramp (52) provided on the surface of the first intermediate bearing device and a throat (51) of reception of this device arranged in the corresponding surface of the stopping device.

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5. Device according to any one of the preceding claims, characterized by the fact that the ramp or each ramp (52) is formed by the bottom of a throat for receiving the device.

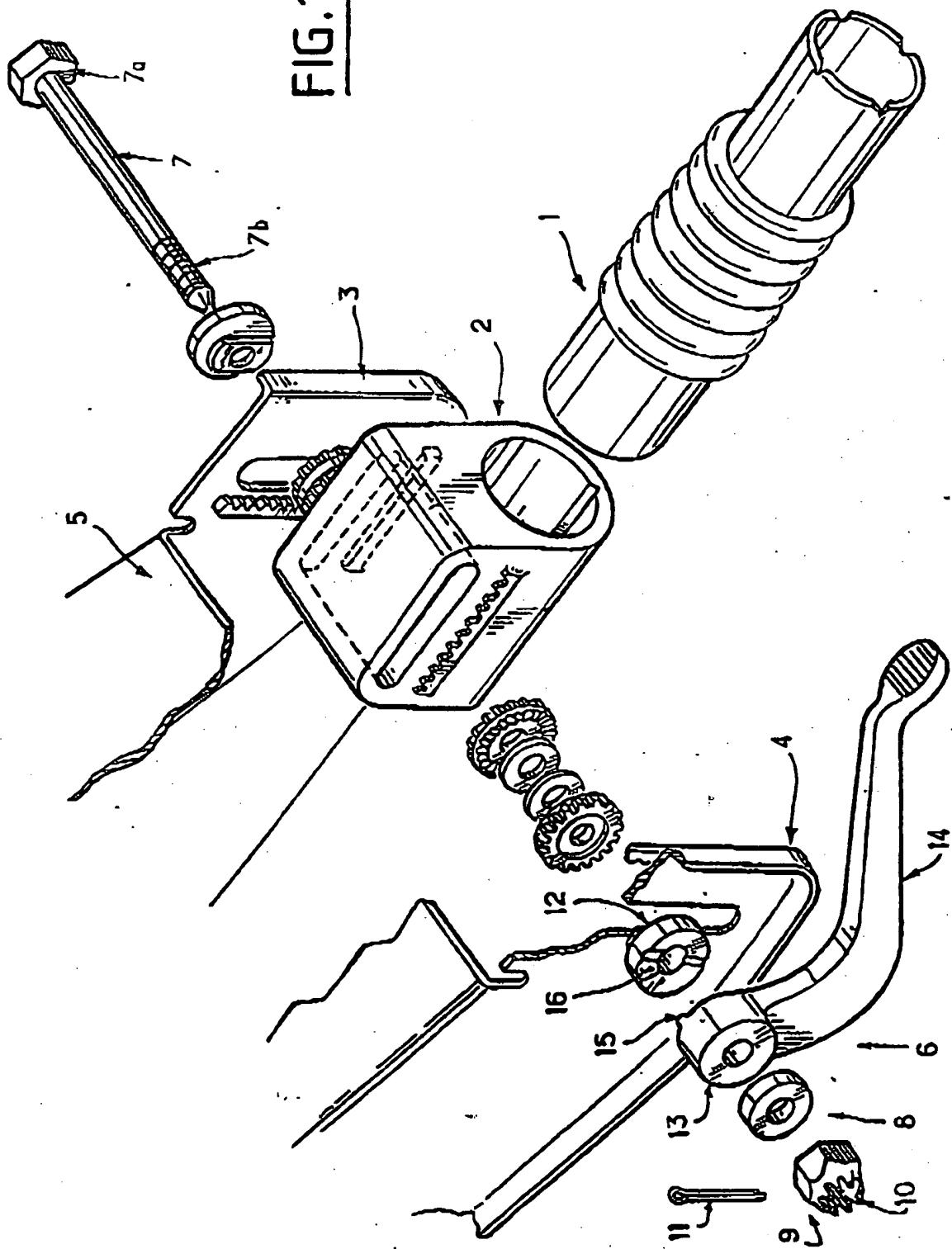
6. Device according to any one of the preceding claims, characterized by the fact that the rolling means (53) contain a stop with pins.

7. Device according to any one of the preceding claims, characterized by the fact that the displacement means include a displacement cage (50) of said rolling device(s).

8. Device according to any one of the preceding claims, characterized by the fact that the displacement means are connected to a protection cap (51) placed around the locking means, and are mobile in rotation around the latter, and the control means consist of a control lever (47) which is of one piece with the cap.

9. Steering column assembly for an automobile whose position can be adjusted, characterized by the fact that it contains a device for locking the position of the column according to any one of the preceding claims.

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FIG.1

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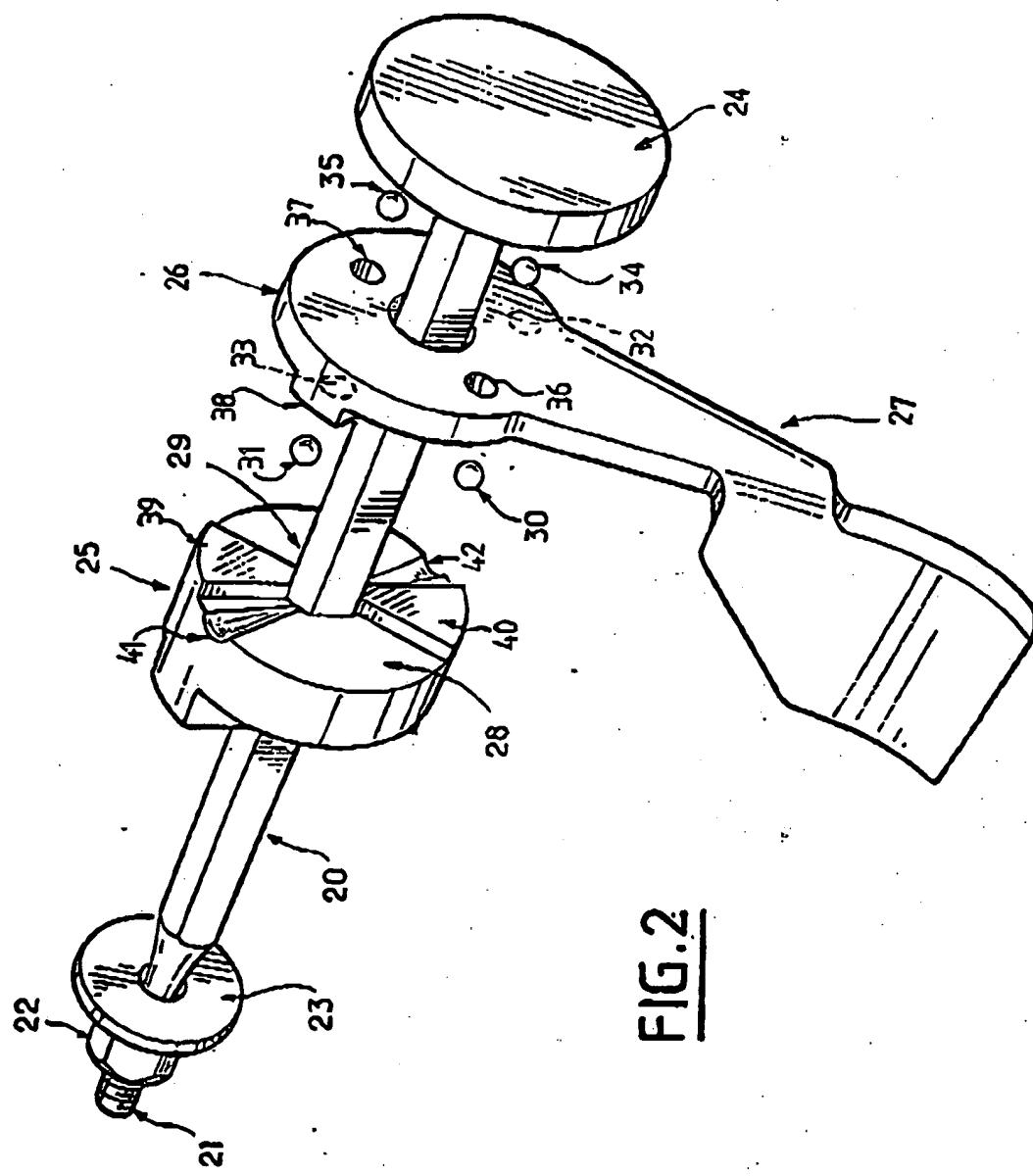
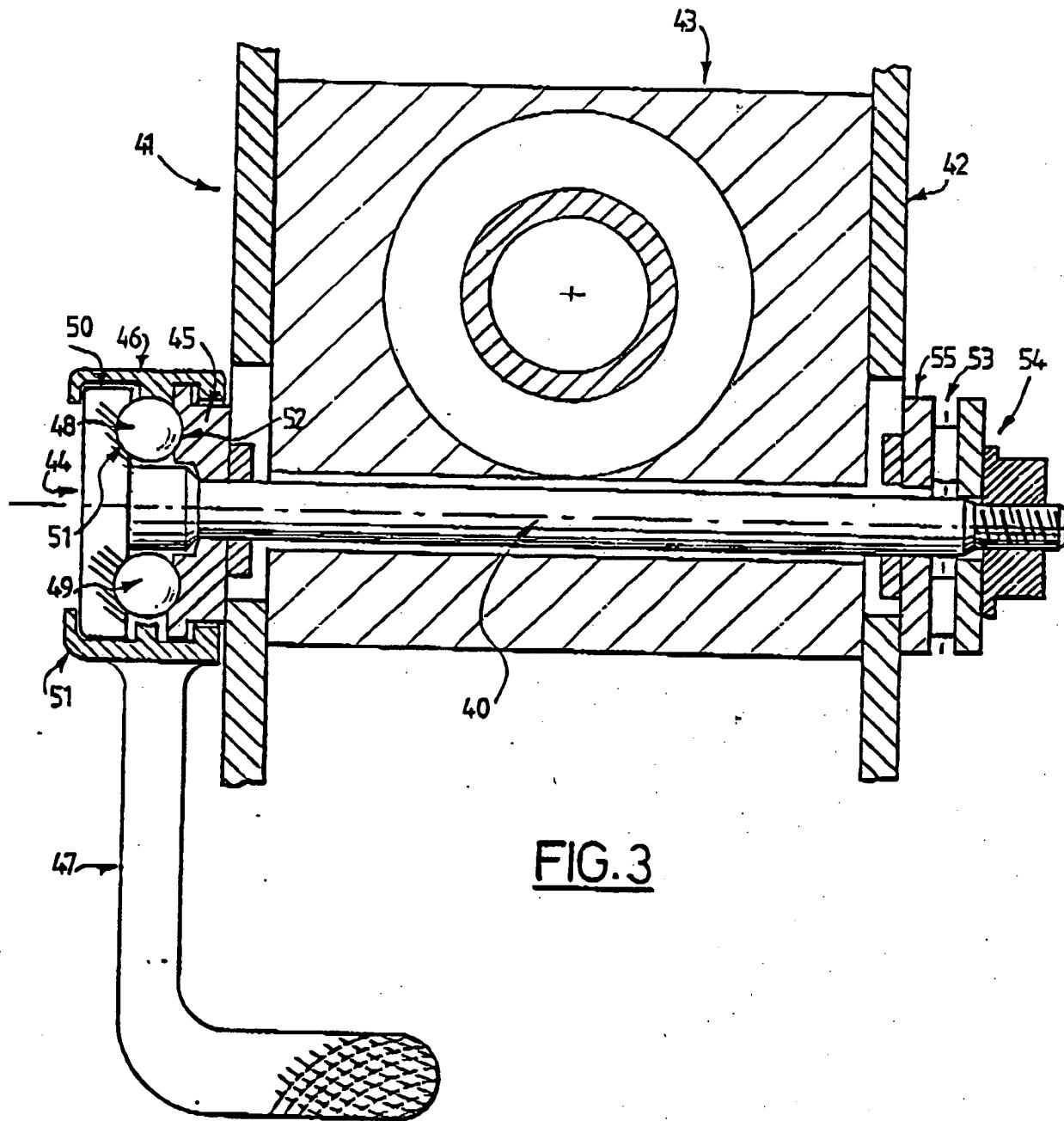


FIG. 2

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FRENCH REPUBLIC  
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**SEARCH REPORT**  
established on the basis of the most  
recent claims filed before the start  
of the search

Application Number

FR 9211837  
FA 476410

<b>DOCUMENTS CONSIDERED TO BE RELEVANT</b>		<b>Claims concerned in the examined document</b>
<b>Category</b>	<b>Citation of document with indication where appropriate, of relevant passages</b>	
X	EP-A-0 427 584 (ECIA-EQUIPMENT AND COMPONENTS FOR THE AUTOMOBILE INDUSTRY) * column 3, line 48 - column 5, line 3; Figures 3-8 * * Claim 1	1, 3-5, 7-9
Y	US-A-4 244 237 (L.G. SPRUNGER) * column 4, line 52 - line 68; figures *	2, 6
Y	EP-A-0 242 928 (VOLVO CAR B.V.) * column 2, line 29 - line 43; figure 1 *	6
A	EP-A-0 493 181 (ECIA-EQUIPMENT AND COMPONENTS FOR THE AUTOMOBILE INDUSTRY)	1, 9
D	* Claim 1; Figure 2 * & FR-A-2 671 040	
D, A	GB-A-2 113 164 (FORD MOTOR COMPANY LIMITED) * page 1, line 121 - page 2, line 49; figure *	1, 9
A	DE-A-4 016 163 (REICHE & CO) * column 5, line 8 - line 9; figures 8, 9 *	6
A	EP-A-0 443 910 (ECIA-EQUIPMENT AND COMPONENTS FOR THE AUTOMOBILE INDUSTRY)	
		<b>TECHNICAL FIELDS SEARCHED (Int.CS)</b>
		B62D
<b>Date of completion of the search</b>		<b>Examiner</b>
June 24, 1993		MARANGONI G.
<b>CATEGORY OF CITED DOCUMENTS</b>		
X:	Particularly relevant if taken alone.	T: Theory or principle underlying the invention.
Y:	Particularly relevant if combined with another document of the same category.	E: Earlier patent document, but published on, or after the filing date.
A:	Technological background.	D: Document cited in the application.
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P:	Intermediate document	&: Member of the same patent family, corresponding document